# EXHIBIT A

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

BUSINESS INSIDER

# California is letting oil companies dump their fluids and waste where the state gets its drinking water

AP SERDAR TUMGOREN, ASSOCIATED PRESS
FEB. 5, 2015, 2:50 PM

BAKERSFIELD, Calif. (AP) — Regulators in California, the country's third-largest oil-producing state, have authorized oil companies to inject production fluids and waste into what are now federally protected aquifers more than 2,500 times, risking contamination of underground water supplies that could be used for drinking water or irrigation, state records show.


*AP Images*

A private property sign hangs on the fence of a shut down injection well located next to an almond orchard owned by Palla Farms, Thursday, Jan. 15, 2015, in Bakersfield, Calif.

While some of the permits go back decades, an Associated Press analysis found that nearly half of those injection wells — 46 percent — were permitted or began injection in the last four years under Gov. Jerry Brown, who has pushed state oil and gas regulators to speed up the permitting process. And it happened despite warnings from the U.S. Environmental Protection Agency since 2011 that state regulators were failing to do enough to shield groundwater reserves from the threat of oilfield pollution.

In California, "we need a big course correction. We need to get the system back in compliance," said Jared Blumenfeld, regional administrator for the EPA. "Californians expect their water is not being polluted by oil producers ... This poses that very real danger."

The injections are convenient to oil companies because drilling brings up 13 gallons of wastewater for every gallon of petroleum. And one of the easiest disposal methods is simply to send that waste back underground.

The federal government is now demanding that state officials take immediate steps to find and deal with any contamination and end oil-industry operations in all aquifers set aside for families and farms.

Those water supplies are especially vital because California, the nation's most populous state and

its agricultural leader, is now entering the fourth year of a historic drought.

State officials acknowledge that regulators erred, citing confusion about the boundaries of aquifers and oil fields or long-standing state misinterpretations of federal water-safety requirements. The vast majority of the permits were granted after the federal Safe Drinking Water Act in 1974.

For some of the permits, "we don't know how this got approved," said Jason Marshall, deputy director of the California Department of Conservation, which directly regulates the state's oil and gas industry.

*AP Images*

A farmworker ties almond tree branches with strings as a pumpjack operates near the orchard, Friday, Jan. 16, 2015, in Shafter, Calif.

In one case, regulators signed off on an application to inject wastewater into a federally protected aquifer, then realized their error and raced to the site.

"He had done injection for about 20 minutes," Marshall recalled. "We just said, 'Stop! You can't do that. Stop.'"

So far, state officials say they have no evidence of water contamination. But worries persist.

"The problem with just monitoring (for contaminants) is once you see it in the well, it's too late," said Timothy Parker, an independent Sacramento-based groundwater expert who has worked for the state Department of Water Resources and in the oil industry. "It's very difficult to clean up an aquifer once it's contaminated."

Over the summer, state oil and gas regulators sent the EPA lists of permits that allow oil companies to inject waste or production fluid into aquifers that were protected by the federal government. In December, the EPA gave the state until Friday to draft a plan for halting the practice and bringing the state into compliance with the 1974 Safe Drinking Water Act. The state has until 2017 to stop injections into any aquifer that has not been specifically designated for oil-industry waste disposal or drilling.

Officials are determined to both "manage the transition" back into compliance with federal law and to "maintain a robust oil industry," said Steve Bohlen, head of oil, gas and geothermal resources for the California Department of Conservation.

Of the 2,553 injection wells that the state has identified as risking contamination of protected aquifers, 1,172 were approved by the state or began injection in the last four years since Brown took office, according to state records.

Brown is a leading supporter of solar, wind and other renewable energy. But the Democratic

governor has also supported tapping California's oil reserves.

In late 2011, Brown fired the state's top two oil-and-gas regulators after oil companies complained that their environmental reviews were slowing drilling permits. By early 2012, he was boasting of a double-digit jump in drilling-permit approvals as a result of those firings.

"The oil rigs are moving in Kern County. We want to use our resources ... our sun and all the other sources of power," Brown told a crowd in 2012 at the opening of a solar plant near Sacramento. "It's not going to be easy. There's going to be screw-ups. There's going to be bankruptcies. There'll be indictments, and there'll be deaths. But we're going to keep going."

Richard Stapler, spokesman for California's Natural Resources Agency, said neither the firings nor Brown's statements played a role in the hundreds of drilling permits granted for protected aquifers in his most recent term.

State officials said high oil prices earlier in the decade and a U.S. push for domestic oil production led to a surge in mistakenly granted permits.

"What we really want to do right now is make sure we're not currently impacting public health and to put safeguards in place to make sure this does not happen again, and then we can determine precisely how it occurred in the past," Stapler said.

Most of the permits were granted for drilling sites in central California's Kern County, one of the country's main oil-producing counties. Many of the injection wells are in oilfields thick with rigs, tanks and disposal wells. But others sit among citrus groves, row crops and homes.The AP found more than 170 permits involved aquifers met both federal and state standards for potential drinking water. That included at least 27 permits that authorized injections into aquifers with water state documents rated clean enough to tap for drinking without treatment.

At issue are so-called Class II injection wells, used to inject high-pressure steam or other material underground to force up oil and gas or to dispose of water — often briny — and other waste that comes up with the oil.

California oil-and-gas industry wells bring up 13 barrels of water for every barrel of oil, and oil companies say having a way to dispose of the waste is essential to the industry.

The injected wastewater is often cleaner than the water already underground. Other times, the injections can include high concentrations of salt or other chemicals.

Industry representatives say any threat to underground water sources is minimal.

"It's not a crisis, not a wide-scale problem. I think the fact the (state) identified the issue, took action and is now seeking to remedy, suggests the system works pretty well," said Tupper Hull of the Western States Petroleum Association.

*AP Images*

Fourth-generation farmer Mike Hopkins, of Palla Farms, poses for photos at his almond orchard Thursday, Jan. 15, 2015, in Bakersfield, Calif.

In an orchard within sight of a disposal wells shut down by the state, fourth-generation farmer Mike Hopkins ran a hand over his face and turned to compose himself when asked about the threat of oil-field wastewater to aquifers farmers use.

Hopkins said damage from injections forced him to pull up his cherry trees in 2013, and he has filed a lawsuit blaming the oil companies with fracking wells and other installations that ring his orchards. The companies deny responsibility.

"We're farmers," Hopkins said. Pulling up the withered fruit trees "broke our hearts."

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Associated Press Writer Serdar Tumgoren in San Francisco contributed to this report.



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# EXHIBIT B

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

SFGATE http://www.sfgate.com/business/article/State-let-oil-companies-taint-drinkable-water-in-6054242.php

# State let oil companies taint drinkable water in Central Valley

By David R. Baker Updated 12:11 pm, Sunday, February 1, 2015

IMAGE 1 OF 8

Aletha, center, and Tom Frantz, right, and family friend Judy Reed, left, plant new almond trees as P.D., the dog, wanders by Jan. 29, 2015 on Frantz's land in Shafter, Calif. Frantz is a fourth generation farmer who recently inherited his father's land and currently has 4,000 almond trees. Frantz is concerned about the quality of his future water supply.



Oil companies in drought-ravaged California have, for years, pumped wastewater from their operations into aquifers that had been clean enough for people to drink.

They did it with explicit permission from state regulators, who were supposed to protect the increasingly strained groundwater supplies from contamination.

Instead, the state allowed companies to drill more than 170 waste-disposal wells into aquifers suitable for drinking or irrigation, according to data reviewed by The Chronicle. Hundreds more inject a blend of briny water, hydrocarbons and trace chemicals into lower-quality aquifers that could be used with more intense treatment.


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Most of the waste-injection wells lie in California's parched Central Valley, whose desperate residents are pumping so much groundwater to cope with the historic drought that the land has started to sink.

"It is an unfolding catastrophe, and it's essential that all oil and gas wastewater injection into underground drinking water stop immediately," said Kassie Siegel, director of the Climate Law Institute at the Center for Biological Diversity environmental group.

The problem developed over decades, starting with a bureaucratic snafu between state and federal regulators. It was made worse by shoddy record keeping and, critics say, plain negligence. The issue erupted into public view last summer when state officials abruptly shut down 11 waste-injection wells in Kern County, fearing they could taint groundwater supplies already feeding homes and farms.

### No contamination

So far, tests of nearby drinking-water wells show no contamination, state officials say. But the federal Environmental Protection Agency, which helped uncover the practice, is threatening to seize control of regulating the waste-injection wells, a job it has left to California officials for over 30 years. The state faces a Feb. 6 deadline to tell the EPA how it plans to fix the problem and prevent it from happening again.

"If there are wells having a direct impact on drinking water, we need to shut them down now," said Jared Blumenfeld, regional adminstrator for the EPA. "Safe drinking water is only going to become more in demand."

California produces more oil than any state other than Texas and North Dakota, and its oil fields are awash in salty water. A typical Central Valley oil well pulls up nine or 10 barrels of water for every barrel of petroleum that reaches the surface.

In addition, companies often flood oil reservoirs with steam to coax out the valley's thick, viscous crude, which is far heavier than petroleum found in most other states. They pump high-pressure water and chemicals underground to crack rocks in the controversial practice of hydraulic fracturing. They use acid and water to clear up debris that would otherwise clog their oil-producing wells.

All of that leftover water, laced with bits of oil and other chemicals, has to go somewhere. Pumping the liquid — known in the industry as produced water — back underground is considered one of the most environmentally responsible ways to get rid of it.

"If we're not able to put the water back, there's no other viable thing to do with it," said Rock Zierman, chief executive officer of the California Independent Petroleum Association, which represents smaller oil companies in the state. "If you were to shut down hundreds of injection wells, obviously that's a lot of jobs, a lot of tax revenue."

Farmers fear that the groundwater they increasingly need to nurture their orchards and crops may one day show signs of pollution, even if it hasn't surfaced yet.

"When I'm concerned for my farm, I'm looking at future generations and reaching a point where they can't use the groundwater because of things we're doing today," said Tom Frantz, 65, a farmer and retired teacher who grows almonds near the town of Shafter (Kern County).

The wastewater injection problem stretches back to 1983.

EPA officials that year signed an agreement giving California's oil field regulators — the state's Divison of Oil, Gas and Geothermal Resources — responsibility for enforcing the federal Safe Drinking Water Act. The agreement listed, by name, aquifers considered exempt, where oil companies could legally inject leftover water with a simple permit from the division. If state regulators wanted to add any aquifers to the list, they would need EPA's aproval.

But there were two signed copies of the agreement, said Steven Bohlen, the division's new supervisor. Eleven aquifers listed as exempt on one copy weren't included on the other. The state and the oil companies considered those aquifers exempt — perfectly suitable

places to dispose of wastewater. The EPA didn't.

"We cannot tell, nor can the EPA, which version is correct," said Bohlen, appointed by Gov. Jerry Brown last year.

The bureaucratic confusion didn't stop there. In some cases, the state treated entire aquifers as exempt when, in fact, only specific portions of them had been approved for oil industry use. In other instances, the state issued injection permits for aquifers that the EPA had never declared exempt, Blumenfeld said.

**Program audit**

The EPA first suspected something was amiss after auditing the division's underground injection control program in 2011 and reviewing its aquifer exemptions the following year. The division scoured its records and found that it had authorized oil companies to pump wastewater into some high-quality aquifers that were supposed to be off-limits.

Poor record keeping added to the problem. Studies on the 11 disputed aquifers, Blumenfeld said, dated from the 1980s and came in printouts stored in envelopes. Vital documents went missing.

"We'd sit down with them and go through these manila envelopes, and there'd be nothing in them, and they'd say, 'Well, there's nothing in this one,'" Blumenfeld said. "That's when we knew we really had a problem."

In all, 464 wells injected wastewater into aquifers that were supposed to be protected, according to state data. That includes 94 wells drilled into the 11 aquifers that the state considered exempt and the EPA didn't.

Some of the aquifers that were breached were so salty that they would be difficult to use. But a third of the aquifers are believed to hold water that — at least before injection began — was clean enough to drink, either with some treatment or none at all.

To gauge water quality in a river, lake or aquifer, researchers often start with the water's total dissolved solids — salts and other materials in the liquid. High counts don't necessarily make water harmful to drink, but they can cloud it and give it a salty or bitter taste.

In general, anything below 500 parts per million requires no treatment and is considered

high quality. Water from San Francisco's Hetch Hetchy system, piped straight from the Sierra, averages 71. State water officials want to prevent contamination of any aquifers that are below 3,000.

**More permits**

And yet, the oil industry drilled 171 injection wells into aquifers with counts of 3,000 parts per million or less, according to state data. Companies also received permits to drill five wells into aquifers of the same quality, but for those wells there is no record of injections.

Another 253 injection wells went into saltier but potentially usable aquifers that the EPA considers protected. Companies received permits for an additional 26 wells of the same quality.

Finally, companies drilled 40 injection wells into aquifers for which there is no water-quality data.

A total dissolved-solids count above 1,000 may require treatment before use, either by blending it with fresher water or putting it through reverse osmosis, the process used in seawater desalination plants. But it is usable, for crops or people.

"There's a cost to this water," Blumenfeld said. "But we want to make sure — and the Safe Drinking Water Act requires us to make sure — that it's protected, because we may need it."

It's unknown exactly how much water lies in the aquifers used for waste injection. A handful of those aquifers are already used for drinking and irrigation — leading to the emergency closure of 11 injection wells in July. Three of those wells were allowed to resume operations after their owners proved that they hadn't accessed a drinking-water aquifer after all.

Officials have tested samples from nine nearby drinking wells and found elevated levels of arsenic and nitrates. But that's common for this corner of the Central Valley, where arsenic often leaches into the water from the native rocks. The drinking wells may have been protected by distance, said Jonathan Bishop, chief deputy director of the State Water Resources Control Board. Even when the oil companies injected wastewater into an aquifer used for drinking and irrigation, the injection wells were drilled deeper than the drinking wells.

"The well will pull water horizontally before it pulls it vertically," said Bishop, whose board is helping to determine whether the injection wells put any drinking water supplies at risk.

He noted, however, that pollutants can migrate over time. "We haven't found any impact, but that doesn't mean we aren't concerned about it," Bishop said. "If that aquifer has drinking water, we don't want them injecting into it."

**Little rain**

Even in relatively wet years, little rain falls in the southern San Joaquin Valley, forcing its farmers to rely on irrigation. Any potential threat to groundwater matters.

Mike Hopkins blames oil companies for tainting the aquifer that used to feed his cherry trees, not far from Bakersfield.

In 2010, some of their leaves started curling up and turning brown, a problem that spread the following year. He tried giving them more water, but that seemed to make things worse. Replacing some of the trees didn't work either, with the new plants quickly losing leaves to the same strange scorching.

Tests of the water revealed high levels of salt and boron, both of which can damage trees. Hopkins eventually ripped out 3,500 dying trees. In September, he sued four companies that had been injecting wastewater near his orchard. The wells closest to his property do not appear to be among the injection wells being reviewed by the EPA and the state.

"That's what we do for a living — we're farmers, we grow things," said Hopkins, 67, managing partner of Palla Farms. "If we don't have water, your property's worth zero."

*David R. Baker is a San Francisco Chronicle staff writer. E-mail: dbaker@sfchronicle.com Twitter: @DavidBakerSF*

**Running dry**

Throughout 2015, The Chronicle will report stories about water growing scarce in California.

# EXHIBIT C

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

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# Long-term solution for wastewater disposal eludes shale gas industry


*Evan Sanders | Trib Total Media*

Randy Billy, with Range Resources, moves brine water into a dropbox, which is then moved into two 100,000 gallon water tanks waiting to be filled before a treatment process at Reserved Environmental Services plant in Mt. Pleasant on Wednesday, Jan. 14, 2015.

By David Conti
Saturday, Jan. 24, 2015, 10:00 p.m.

Defining wastewater disposal in the Marcellus shale fields has been a moving target.

Drillers initially sent millions of gallons to public water treatment plants, until regulators said the plants were not equipped to properly clean the salt- and metal-laden water that comes from shale gas wells. The traditional method of injecting it back into deep wells is less feasible in Pennsylvania, which has few such wells, and Ohio is accepting less wastewater because of potential links between injection and earthquakes.

The search for a solution has spawned an industry of companies and innovators looking for ways to treat or reuse the wastewater that environmentalists feared would foul drinking supplies.

“They can barge all this water somewhere else or reuse it, which is what we're seeing now,” said Radisav Vidic, chair of the University of Pittsburgh's civil and environmental engineering program and a leading researcher on management of gas drilling waste.

Recycling wastewater from hydraulic fracturing in shale gas production has become the norm in the Marcellus and Utica shale plays. About 90 percent of what comes out of wells goes into the next job, Vidic

said.

“What we call disposal is disposal to the generator. We find a home for it in the drilling fields,” said Andrew Kicinski, president of Collier-based Reserved Environmental Services, whose plants in Mt. Pleasant in Westmoreland County and in Butler County treat wastewater for companies including Range Resources, Rice Energy and Rex Energy. The company formed in 2006 but has been devoted to treating gas waste since 2009 and plans to expand.

At some point, though, the fields won't take it all. The industry, regulators and researchers must find a long-term disposal solution for when the amount of wastewater exceeds what companies need to continue drilling and fracking, environmental leaders say.

“It needs to be all of the above groups working together,” said Davitt Woodwell, president of the Pennsylvania Environmental Council. “Companies are trying to figure out what to do with this because handling water is so expensive. Regulators are looking for the best technology.

“The innovators are looking to find the next big thing.”

Desalination

Companies use up to 5 million gallons of water to frack a Marcellus well, typically drawn from a river or provided by a water company. About 30 percent returns to the surface in the first two or three weeks, during what the industry calls “flowback,” and more returns over years of production.

It's contaminated mostly with heavy salts from the shale, as well as dissolved solids, metals and sometimes radioactive material.

“The most difficult thing to get out is the salt,” said Tony Gaudlip, who as director of civil engineering and construction at Range Resources oversees water management at the state's most prolific shale driller.

Specialized treatment plants can take out the solids, metals and radioactive material, though salts remain. A report this month from Duke University said ammonium and iodides can remain. Pennsylvania does not allow treatment plants to discharge wastewater from fracking into waterways.

In looking at ways to potentially make the water safe to return to streams, Range decided to go the other way. Unlike the high-heat fracking prevalent in Texas, Appalachian shale extraction does not require pure water at the start, Gaudlip said.

“We said, ‘Let's just go with the waste streams we had available,' ” he said of the decision in 2009.

The wastewater can go right to the next job, where it's mixed with fresh or treated water for use in drilling or fracking, or to a treatment facility such as Reserved Environmental Services' plants before it's stored for another job, Gaudlip said.

The treatment gets the water clean enough for safe handling, though it remains a brine solution.

North Strabane-based Comtech Industries focuses almost solely on the gas industry. The company sets up centralized treatment operations to handle water from several sites at once for customers that include major producers such as Cabot Oil & Gas and Chevron Corp.

“We're able, based on those staging areas, to use three-quarters fresh (water) and 25 percent recycled on most wells, but we've done a whole frack on nothing but recycled,” said Cabot spokesman George Stark.

‘You better get busy'

Nobody can say how long recycling will remain viable. Kicinski, whose company plans to open a facility this year to keep up with demand, said he expects recycling to remain predominant for at least 15 years.

Whether companies will have an excess of wastewater on their hands after that depends on drilling and production levels.

Many say they can't wait until then to look for long-term disposal solutions, especially as deep-well injection falls out of favor. Grant Township in Indiana County is fighting in federal court a proposal to put such a well there. The Coast Guard has yet to rule on a proposal to transport wastewater by barges to other states.

“If you're projecting that that curve is going to happen in seven or 10 years, you better get busy now,” said Joe Tirreno, executive vice president of Comtech.

Researchers and a few innovators are focused on desalination technologies that can remove the salt as crystals, leaving behind other solids that can be taken to landfills, and distilled water.

“Crystallization, I've always thought, is the approach that will work,” Gaudlip said of several processes that produce salt ready for use on icy roads.

Fairmont Brine Processing has a plant in West Virginia that converts wastewater to salt crystals, sludge

and distilled water by using pressure and heat, said CEO Dave Moniot. The process requires a lot of energy and several expensive plants spread across Appalachia to cut down on transportation, Vidic and others said.

“Those are big capital commitments. They'll want operators to sign commitments, and we still need water for the foreseeable future,” Gaudlip said.

Vidic received a $496,000 grant from the Department of Energy to explore a less-energy-intensive technology to remove salts by using low-grade heat from power plants to filter wastewater through membranes. Work on that just began.

Making desalination commercially viable will require finding uses for the resulting crystals beyond road salt, Vidic said.

“We will have to develop some chloride or chlorine-based industry to make from it,” he said.

“If someone wants to invest in that, you will have feedstock for as long as you want,” Tirreno said.

Concerns

Treated water can and has leaked while companies store it between jobs in tanks or earthen impoundments.

Range is installing double-liner systems with leak protection in its impoundments as part of a $4.15 million settlement with Pennsylvania over leaky pools. EQT Corp. is fighting a $4.5 million fine for leaks at its impoundments.

The state needs to do a better job of tracking what companies do with wastewater, said John Walliser, vice president of the Pennsylvania Environmental Council. The state Department of Environmental Protection is reviewing its reporting requirements.

“It's not enough to say, ‘We subcontracted that out for disposal' and leave it to someone else to report what happens,” Walliser said.

Trucking water to disposal sites raises the risk of spills, Woodwell said.

The goal should be a technology that gets wastewater back to a state in which it is safe to return to the hydrologic cycle, he said.

David Conti is a Trib Total Media staff writer. Reach him at 412- 388-5802 or dconti@tribweb.com.

# EXHIBIT D

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

THE WALL STREET JOURNAL.



http://www.wsj.com/articles/bakken-shale-oil-well-wastewater-leak-taints-river-in-north-dakota-1421977006

# Leak of Oil-Well Wastewater Taints River in North Dakota

State Says Bakken Shale Region Pipeline Leak of 3 Million Gallons Is Biggest-Ever Spill of 'Brine'

By **CHESTER DAWSON**

January 22, 2015

Crews dig up land at a saltwater-spill site outside Williston, N.D., on Jan. 12. *PHOTO: ASSOCIATED PRESS*

Salty wastewater from oil wells has contaminated a creek and flowed into the Missouri River after a huge pipeline leak in North Dakota, state officials said Thursday.

The state said the leak of 3 million gallons is its biggest-ever spill of "brine," which in addition to high concentrations of salt often contains trace amounts of heavy metals that can be radioactive.

Such spills, which can kill vegetation and ruin farmland, have been increasing in

Western North Dakota as the state has become a leading oil producer, pumping more than a million barrels of crude a day from the Bakken Shale.

Briny wastewater is extracted from deep underground along with oil and gas and must be disposed of, usually by injecting it back into the ground at separate wells drilled specifically for that purpose.

The state is investigating the cause of the leak, which doesn't currently pose a threat to public health or drinking water, North Dakota officials said.

The area where the spill occurred is sparely populated and officials in surrounding Williams County said they weren't concerned about the impact on water supplies, which are miles downstream from the area affected.

The Bakken region also is cleaning up from an unrelated oil spill over the weekend in the Yellowstone River, a tributary of the Missouri. An oil pipeline under the river burst, releasing about 960 barrels of crude near Glendive, Mont., and contaminating the local water-treatment plant.

In North Dakota, about 2.7 million gallons of wastewater have been collected from Blacktail Creek in a rural area about 15 miles north of Williston, N.D.

The cleanup effort has been complicated by winter weather that has made it more difficult to track the spread of the contamination and pump out the wastewater from the ice-covered creek, said Dave Glatt, chief of the state health department's environmental section.

The wastewater leak was first detected two weeks ago when the Texas-based pipeline operator, privately held Summit Midstream Partners LLC, said that an "undetermined amount" of brine had spilled out of the line, which was installed in June.

The company's "full and undivided attention is focused on minimizing and remediating any environmental impacts, ensuring cleanup efforts, and addressing the needs of impacted landowners, regulators and government officials," said Jonathan Morgan, a Summit spokesman.

The Summit Midstream pipeline collects water from 40 well pads and ships it to a disposal facility operated by a third party, the company said.

The state has faced a number of challenges handling the surge in wastewater, ranging

from spills by tanker trucks and ruptured pipelines to storage tanks filled with the salty water that have been struck by lightning.

About 20,000 miles of gathering pipelines crisscross North Dakota, including those carrying wastewater to disposal sites, according to state data.

In 2013, North Dakota's state legislature voted down a bill that would have required flow meters and pressure cutoff devices on wastewater pipelines. But state regulators have proposed tightening rules on the disposal of lightly radioactive well waste.

**Write to** Chester Dawson at chester.dawson@wsj.com

## Corrections & Amplifications

Summit Midstream Partners LLC told North Dakota regulators an "undetermined amount" of briny wastewater had spilled out of a pipeline when the company first detected a leak earlier this month. An earlier version of this article incorrectly quoted the company as saying an "undermined amount." (Jan. 23, 2015)

# EXHIBIT E

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**» Print**



# Millions of gallons of saltwater leak into North Dakota creek

Thu, Jan 22 2015

By Ernest Scheyder

WILLISTON, N.D. (Reuters) - Almost 3 million gallons of potentially toxic saltwater leaked from a western North Dakota pipeline into a creek that feeds the Missouri River, the largest spill of its kind in the state's history.

The leak, from a four-inch saltwater pipeline operated by Summit Midstream Partners LP approximately 15 miles north of Williston, occurred earlier this month and was reported to state officials on Jan. 7. It's not clear what caused the leak and an investigation is underway, a Summit spokesman said.

Saltwater spills are not uncommon in the oil patch, though the size of the Summit leak has caught many by surprise. While the spill was first reported publicly on Jan. 8, a statement late Wednesday from the Department of Health was the first to disclose the spill's volume.

The impact of spill on the local environment and the length of time needed for a cleanup is being assessed, officials said, though mop-up operations from other smaller accidents have taken years.

"Our goal is: you make the mess, you clean it up," said Dave Glatt, spokesman for the North Dakota Department of Health.

Saltwater is a byproduct of the hydraulic fracturing process, or fracking. The water has a much higher concentration of brine than regular saltwater, and can contain petroleum and metal filings picked up during the fracking process.

Typically it is filtered and re-injected back into the earth after oil is extracted, though pipelines or trucks are required to transport it to injection sites.

The leak does not pose a threat to drinking water supplies, the North Dakota Department of Health said in a statement released on Wednesday. Summit said it does not believe wildlife was affected.

Several boom barriers had been placed in Blacktail Creek downstream from the broken pipe, according to a Reuters reporter who visited the area on Thursday. Parts of the creek were laced with a copper-colored sediment that did not resemble typical North Dakota soil, the reporter said.

Remediation officials would not allow access to the site of the damaged pipe, which was a few hundred yards away from a small Lutheran church.

It is by far the largest saltwater spill ever in North Dakota, eclipsing a leak of about 1 million gallons last July from a Crestwood Midstream Partners pipeline into Lake Sakakawea.

The saltwater from the Summit line leaked into a creek that passes by Williston, considered the capital of the state's oil boom, and flows into the Missouri River.

Williston's drinking water comes from the Missouri River, though the city's water department has the ability to turn off collection valves until any harmful material washes downstream.

The state's Department of Health said it is monitoring cleanup efforts, and the state's Department of Mineral Resources is inspecting Summit's entire pipeline network, officials said.

Summit has hired Stantec Inc to clean up the spill. About 2 million gallons of water have been pulled so far from one of the affected creeks, though it was not immediately clear if that amount was all saltwater or normal water flow.

Remediation will be difficult given that much of the affected area is covered by ice.

"We will continue to work tirelessly to see that the cleanup is completed," Rene Casadaban, Summit's operating chief, said in a statement.

It's not clear when the line will re-open, though much of Summit's business involves natural gas transport, meaning day-to-day operations should largely be unaffected.

Shares of Summit closed down 6 cents to $33.97 per share on Thursday. In the past three months the stock has lost 29 percent of its value, part of a broader sell-off in the energy industry amidst low oil and natural gas prices.

(Reporting by Ernest Scheyder; Editing by Leslie Adler and Alan Crosby)

# EXHIBIT F

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

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# Fracking Brings Ammonium and Iodide to Local Waterways

Researchers find alarming levels of these new contaminants in wastewater released into Pennsylvania and West Virginia streams

January 14, 2015 | By Marianne Lavelle and The Daily Climate

The findings have major implications for whether stronger regulations are needed to curb water pollution from fracking and other oil and gas industry operations.
*Credit: Jeff Turner/Flickr*

Two hazardous chemicals never before known as oil and gas industry pollutants—ammonium and iodide—are being released and spilled into Pennsylvania and West Virginia waterways from the booming energy operations of the Marcellus shale, a new study shows.

The toxic substances, which can have a devastating impact on fish, ecosystems, and potentially, human health, are extracted from geological formations along with natural gas and oil during both hydraulic fracturing and conventional drilling operations, said Duke University scientists in a study published today in the journal *Environmental Science & Technology*.

The chemicals then are making their way into streams and rivers, both accidentally and through deliberate release from treatment plants that were never designed to handle these contaminants, the researchers said.

The findings have major implications for whether stronger regulations are needed to curb water pollution from fracking and other oil and gas industry operations. Over the years, the industry has faced questions about unsafe well design that allows methane to seep into drinking water, and about lubricants and other chemicals it adds to frack water. Duke researchers have conducted a number of studies on these problems.

Now add to the list of concerns ammonium and iodide—two naturally occurring, dangerous chemicals that are essentially unregulated in oil and gas wastewater.

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"We are releasing this wastewater into the environment and it is causing direct contamination and human health risks," said study co-author Avner Vengosh, professor of water quality and geochemistry at Duke's Nicholas School of the Environment. "It should be regulated and it should be stopped. That's not even science; it's common sense."

Industry sources did not respond immediately to word of the new study.

When dissolved in water, ammonium can turn to ammonia, highly toxic to aquatic life. The Duke team found ammonium levels in streams and rivers from energy industry wastewater outflows at levels 50 times higher than the U.S. Environmental Protection Agency's water-quality threshold. Under a loophole created by Congress in a 2005 energy law, fracking wastewater isn't regulated under the U.S. Safe Drinking Water Act.

Meanwhile, the Duke scientists found that the iodide contamination from energy operations – while not toxic by itself – promotes the production of disinfection byproducts when it comes in contact with the chlorine that is used to treat most drinking water systems. Previous studies have shown that such disinfection byproducts have toxic and carcinogenic properties, but only a few are regulated.

"As far as we are aware, iodide and ammonium are not regulated, nor monitored in any of the [oil and gas] operations in the United States," the researchers said in their paper.

Terrence Collins, director of the Institute for Green Science at Pittsburgh's Carnegie Mellon University, was not involved in the study but said findings of iodide contamination are particularly worrisome, especially if stream or river water is extracted downstream for drinking water.

"Widely practiced chemical treatments to kill pathogens are likely to cause the iodide to become incorporated into organic matter in the drinking water, and I am concerned that this could result in increased incidences of cancer," he said in an email.

The recent boom in U.S. oil and gas production has been accompanied by a surge in wastewater production. Fracked wells produce about 1 million to 2 million gallons of wastewater per well. For conventional wells, the volume is less but the risk of contamination with ammonium and iodide is the same. "The method doesn't matter," said Vengosh.

"Fracking fluids are not much different from conventional oil and gas wastes," said Jennifer Harkness, lead author of the study and a doctoral student at Duke.

The researchers collected and analyzed 44 samples of wastewater produced from conventional oil and gas wells in New York and Pennsylvania and 31 samples of "flowback"—the highly saline and polluted fluid that flows back to the surface during and after fracking—from shale gas wells in Pennsylvania and Arkansas. They also collected and analyzed oil and gas effluents being directly discharged into streams, rivers and surface waters at three disposal sites in Pennsylvania and a spill site in West Virginia.

In states like Texas and Oklahoma, with long histories of conventional drilling, oil and

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gas wastewater is disposed by injection in deep underground wells. But in Pennsylvania, a hotbed of fracking, there are few such sites. Some oil and gas wastewater is discharged to waterways after treatment at commercially operated industrial brine treatment plants, which were not designed to remove ammonium or iodide.

There also have been wastewater spills, including seeps from illegal disposal, leaking from surface impoundments, and truck tanker accidents. Some states even have purposely spread the salty oil and gas wastewater on roads to suppress dust or for de-icing.

The estimated volume of oil and gas industry wastewater generated in the U.S. is now more than 837 billion gallons (3.18 billion cubic meters) per year. For comparison, that's nearly three times the volume of all the oil and gasoline that the United States consumes each year (291 billion gallons).

The researchers said their study adds to a growing body of evidence that government action is needed. "There are significant environmental and ecosystem impacts of current [oil and gas wastewater] disposal practices in the U.S.," they wrote, "Regulatory action is needed to address these concerns."

*Marianne Lavelle is a staff writer for The Daily Climate. Follow her on Twitter @mlavelles. The Daily Climate is a nonprofit news site covering energy, the environment and climate change.*



## Comments



**bigbadwuff** January 14, 2015, 9:03 PM

I wouldn't call it fraud ..... although the chemicals are "naturally occurring" - and not part of the fracking fluid "special sauce", this underscores the many unknows brought about by the fracking process - which is anything but natural:

I think they do a good job of making the distinction to anyone who reads into the article .. poison is poison, regardless of source:

" extracted from geological formations along with natural gas and oil during both hydraulic fracturing and conventional drilling operations"

So it may not be the fracking fluid that ultimately poisons our ground and surface water, but rather the natural minerals dissolved by the fracking process.



**Wayne Williamson** January 21, 2015, 6:50 PM

I think its interesting that iodide is found in iodized salt(most of the salt you would have bought in the store) and that combined with chlorine which is in all tap water is one of the cancer causing things mentioned in the article...



**FredOlsen** January 23, 2015, 7:09 PM

These researchers must be mistaken. The virtuous fracking industry has assured us that this kind of thing cannot happen. And if it ever should happen, it's nice and legal. Toxic sludge is good for you.

MIND PsySociety | 22 hours ago

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**ltsnyder** February 8, 2015, 8:40 AM

This is one of the "Hide and Seek" issues created by this toxic industry. There is strong evidence this IS part of the fracturing fluid.

Imagine how long it would have take for the US to regulate Asbestos or Mercury, or DDT, if they were declared proprietary ingredients and people settled with gags in the contract.

Imagine trying to win a case against DDT poisoning in court before the issues were know.

This whole process is insanity and it will turn PA into one big drill well area. Shallow shale is done in high density drilling with wells 600' apart, when they finish with this shallow shale oil play, cancer will be the norm like it is in LA cancer ally.

Here is just one high density driller in PA.

http://www.maptive.com/ver3/edit/index.php?5267d062c1c9af8cc643a89bcfd9e113

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**jonsalt999** ➚ **Wayne Williamson** February 13, 2015, 10:11 AM

and the entire Marcellus area was once a huge salt sea. what BS this article is;

the drillers in Pa have not dumped waste into the streams and rivers for 3 or more yrs now, but reuse for HF after filtering.

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# EXHIBIT G

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

The New York Times | http://nyti.ms/1uTqfnJ



N.Y. / REGION

# Citing Health Risks, Cuomo Bans Fracking in New York State

By THOMAS KAPLAN DEC. 17, 2014

Gov. Andrew M. Cuomo's administration announced on Wednesday that it would ban hydraulic fracturing in New York State because of concerns over health risks, ending years of debate over a method of extracting natural gas.

Fracking, as it is known, was heavily promoted as a source of economic revival for depressed communities along New York's border with Pennsylvania, and Mr. Cuomo had once been poised to embrace it.

Instead, the move to ban fracking left him acknowledging that, despite the intense focus he has given to solving deep economic troubles afflicting large areas upstate, the riddle remained largely unsolved. "I've never had anyone say to me, 'I believe fracking is great,' " he said. "Not a single person in those communities. What I get is, 'I have no alternative but fracking.' "

In a double blow to areas that had anticipated a resurgence led by fracking, a state panel on Wednesday backed plans for three new Las Vegas-style casinos, but none along the Pennsylvania border in the Southern Tier region. The panel, whose advice Mr. Cuomo said would quite likely be heeded, backed casino proposals in the Catskills, near Albany and between Syracuse and Rochester.

For Mr. Cuomo, a Democrat, the decision on fracking — which was immediately hailed by environmental and liberal groups — seemed likely to help repair his ties to his party's left wing. It came after a surprisingly contentious re-election campaign in which Zephyr Teachout, a primary challenger who opposed fracking, won about a third of the vote.

The question of whether to allow fracking, which involves injecting large amounts of water, sand and chemicals deep underground at high pressures to release oil and natural gas from rock formations, has been one of the most divisive public policy debates in New York in years. Fracking is occurring in many states, and has boomed in places like Pennsylvania and Texas. Environmental advocates, alarmed by the growth of the practice, pointed to New York's decision as the first ban by a state with significant natural-gas resources.

Mr. Cuomo, who has prided himself on taking swift and decisive action on other contentious issues like gun control, took the opposite approach on fracking. He repeatedly put off making a decision, most recently citing a continuing — and seemingly open-ended — study by state health officials.

On Wednesday, six weeks after Mr. Cuomo won a second term, the long-awaited health study finally materialized, its findings made public during a year-end cabinet meeting convened by the governor in Albany.

In a presentation at the cabinet meeting, the acting state health commissioner, Dr. Howard A. Zucker, said the examination had found "significant public health risks" associated with fracking.

Holding up copies of scientific studies to animate his arguments, Dr. Zucker listed concerns about water contamination and air pollution, and said there was insufficient scientific evidence to affirm the safety of fracking.

Dr. Zucker said his review boiled down to a simple question: Would he want his family to live in a community where fracking was taking place?

His answer was no.

"We cannot afford to make a mistake," he said. "The potential risks are too great. In fact, they are not even fully known."

New York has had a de facto ban on fracking for over six years, predating Mr. Cuomo's election. In 2012, he flirted with approving a limited program in several Southern Tier counties. But that same year, he bowed to entreaties from environmental advocates, stating instead that his administration would begin a new study on health risks.

Mr. Cuomo had focused much of his attention on trying to improve the

economic climate upstate, and fracking appeared to offer a solution to struggling areas atop the Marcellus Shale, a gas-rich rock formation that extends across parts of several states, including New York, Ohio, Pennsylvania and West Virginia.

But there was also strong opposition from groups worried about the effects of fracking on the state's water supply, as well as on tourism and the quality of life in small upstate communities.

As he traveled around the state, Mr. Cuomo was hounded by protesters opposed to fracking, who showed up at his events and pressed him to impose a statewide ban. Opponents were also aided by celebrities who drew attention to their cause.

Complicating matters, dozens of communities across New York have passed moratoriums and bans on fracking, and in June, the state's highest court, the Court of Appeals, ruled that towns could use zoning ordinances to ban fracking.

Local bans, on top of restrictions that the state had planned, put 63 percent of the Marcellus Shale off limits to drilling, said Joseph Martens, the state environmental conservation commissioner. "The economic benefits are clearly far lower than originally forecast," he said.

On Wednesday, Mr. Cuomo seemed determined to portray both of the day's major announcements — and their consequences for upstate New York — as decisions made by experts objectively weighing the facts, not by him.

At the cabinet meeting, he conspicuously stumbled on the name of the panel that made the casino recommendations, as if to signal his lack of involvement in its work. And he kept some distance from the fracking decision, saying he was deferring to his health and environmental conservation commissioners.

"I am not a scientist," he said. "I'm not an environmental expert. I'm not a health expert. I'm a lawyer. I'm not a doctor. I'm not an environmentalist. I'm not a scientist. So let's bring the emotion down, and let's ask the qualified experts what their opinion is."

Nevertheless, environmental groups cast the governor as a hero. Michael

Brune, the executive director of the Sierra Club, said, “This move puts significant pressure on other governors to take similar measures to protect people who live in their states.”

Fracking supporters accused Mr. Cuomo of giving in to environmentalists’ efforts to stoke public fears.

Karen Moreau, the executive director of the New York State Petroleum Council, attributed the fracking ban to a decision by the governor “that he wants to align himself with the left.”

“Our citizens in the Southern Tier have had to watch their neighbors and friends across the border in Pennsylvania thriving economically,” she said. “It’s like they were a kid in a candy store window, looking through the window, and not able to touch that opportunity.”

### *Correction: December 17, 2014*

*Because of an editing error, an earlier version of this article incompletely described hydraulic fracturing. It is a method of extracting natural gas or oil, not just oil, from deep underground. The error was repeated in the summary.*

Jesse McKinley contributed reporting.

A version of this article appears in print on December 18, 2014, on page A1 of the New York edition with the headline: Cuomo Bans Fracking, Saying Risks Trump Economic Potential.

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# EXHIBIT H

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

# Dilemma in the Marcellus Shale: How to dispose of radioactive oil and gas waste?

October 12, 2014 12:00 AM

## By Anya Litvak / Pittsburgh Post-Gazette

A few months ago, a Marcellus Shale operator approached Leong Ying, business development manager at the radiation measurement division of Thermo Fisher Scientific, with a problem.

The driller, whom Mr. Ying declined to name, was trying to dispose of oil and gas waste at area landfills but the trucks kept tripping radiation alarms.

Rejected trucks had to be sent back to well pads or taken out of state, both costly options. It was happening enough that it started nudging the company's bottom line, Mr. Ying said.

"Once you hit them in the pocket, then they stand up and take notice," he said.

Mr. Ying's company is marketing a new radiation detector that can instantly categorize the different types of radioactive materials present in waste and their concentrations.

Today, the most likely solution to deal with radioactive oil and gas waste is to dilute it with non-radioactive materials, such as soil, and then send it to local landfills.

Mr. Ying said his client has built a multimillion-dollar facility specifically designed to treat such waste using a reverse osmosis process, which separates the water from the solids, where the radioactivity is concentrated. Those solids are then either spread out across truck loads, diluted and disposed of at local landfills, or taken to specialty facilities.

In the first half of this year, 421 trucks carrying oil and gas waste tripped radiation alarms at Pennsylvania landfills, according to the state Department of Environmental Protection. All but two of those trucks eventually dumped their waste at those landfills.

Last year, 1,015 loads set off the alarms, up slightly from 2012. Only five were subsequently asked to find another, more suitable, destination for low-level radioactive waste.

There were also 232 oil and gas related alarms that went off at waste transfer stations, which are facilities where waste is processed before disposal.

It's likely that many, if not most, trucks bearing loads with high radioactive readings never show up at area landfills.

“A lot of companies are surveying before they leave a drilling site,” said Carl Spadaro, environmental general manager at Max Environmental, which operates two landfills in southwestern Pennsylvania.

“If it [sets off] alarms there, they’ll make a decision to send the truckload somewhere else. It's in your best interest to scan before something leaves” the well pad.

Landfill alarms sound when a truck carrying waste registers at or above a dose rate of 10 microrem per hour above what is naturally in the air. That's a measure of the potential of that waste to pose harm to humans.

The 10 microrem threshold is extremely low, according to Todd Brautigam, a Pittsburgh-based radiological specialist with Georgia-based Enercon. It’s about what the natural variation is for a particular location depending on time of day, weather and other conditions.

The DEP gives landfills an annual limit on how much of this waste they can accept.

Each load that sets off an alarm but comes in below 140 microrems per hour can probably still be disposed off in a landfill. It gets subtracted from a landfill’s annual limit based on a formula that takes into account the amount of the waste and exact dose rate.

For anything above 140, the landfill operator has to contact the DEP and the waste will have to find a different home, likely out of state. Anything below 10 microrem per hour gets counted as if it were a zero, raising some concerns about accumulation of this material over time.

There is no reliable mechanism for the DEP to keep track of how much oil and gas waste is going into state landfills. Landfill records, which are filed on paper, don’t give breakdowns of waste by industry. Drillers are required to report where they submit their waste electronically, but, as a recent Post-Gazette analysis (http://powersource.post-gazette.com/powersource/companies-powersource/2014/08/31/Shale-drillers-landfill-records-don-t-match-the-state-s-Pennsylvania/stories/201408310111) showed, there is widespread underreporting and inaccuracies in that data.

Because of these discrepancies, it is also impossible to know how much oil and gas waste goes straight to out-of-state landfills that specialize in low-level radioactive waste. There are a few such facilities in Michigan, Idaho and Utah.

Oil and gas discards fall into the category of residual waste, a type of waste that has been growing in Pennsylvania. In 2010, the amount of residual waste tonnage accepted at Pennsylvania landfills shot up. The average weight of such waste since then has been more than a third higher than in the four years before.

The radioactivity in oil and gas waste falls under the category of “Technically Enhanced Naturally Occurring Radioactive Material,” or TENORM.

Drilling and fracking waste is far and away the biggest TENORM trigger for radiation alarms at Pennsylvania landfills. The landfills were required to install sensors in 2001 to monitor hospital-generated waste. But drilling and fracking waste comprised more than 85 percent of radiation alarms tripped over the past year and a half.

Drilling and fracking dredges up the uranium, radium, thorium, strontium and barium buried deep underground and brings them to the surface along with drill cuttings, drilling muds and flowback fluid and brine.

The majority of the loads tripping alarms are actually liquids that have been solidified into a sludge. They comprised more than three-quarters of radioactive loads last year.

David Yoxtheimer, an extension associate with Penn State University's Marcellus Center for Outreach, said there might actually be less radioactive sludge going forward. Drillers are getting less picky about what's in the treated water they reuse for fracking.

Whereas several years ago, many were telling treatment plants to remove as many metals as possible from the flowback in order to reuse it — those metals would then be condensed into the sludge that gets trucked to landfills — more recently operators are finding it's as effective to frack with metal-laden water, so the radioactive elements remain in the fracking brew.

A long-awaited DEP study of radioactive material in oil and gas waste and its potential impacts on humans and the environment is scheduled to be released before the end of the year.

*Anya Litvak: alitvak@post-gazette.com (mailto:alitvak@post-gazette.com) or 412-263-1455.*



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# EXHIBIT I

**TO FOIA REQUEST OF NATURAL RESOURCES DEFENSE COUNCIL FOR RECORDS CONCERNING THE STORAGE AND DISPOSAL OF WASTES FROM OIL AND GAS EXPLORATION, DEVELOPMENT, AND PRODUCTION**

David Hasemyer and Zahra Hirji

# In Fracking's Wake:

## Open Pits Offer Cheap Disposal for Oil and Gas

October 2, 2014

By David Hasemyer and Zahra Hirji, InsideClimate News

NORDHEIM, Texas—School Superintendent Kevin Wilson tugged at his oversized belt buckle and gestured toward a field less than a mile from Nordheim School, where 180 children attend kindergarten through 12th grade.

A commercial waste facility that will receive millions of barrels of toxic sludge from oil and gas production for disposal in enormous open-air pits is taking shape there, and Wilson worries that the ever-present Texas wind will carry traces of dangerous chemicals, including benzene, to the school.

"Many of these students live outside of where they could be exposed," said Wilson, a contemplative man with a soft Texas accent. "But we are busing them to the school, putting them in the direct path of something that could be harmful to them. It makes you think: Are we doing what's best for the students?"

Along with Nordheim's mayor and other angry residents, Wilson is trying to stop the 204-acre facility, but he faces an uphill battle. In Texas, as in most states, air emissions from oil and gas waste are among the least regulated, least monitored and least understood components in the extraction and production cycle. Although the wastewater and sludge can contain the same chemicals used in hydraulic fracturing and other processes—chemicals known to affect human health—little has been done to measure waste emissions or determine their possible impact on nearby residents.

This gap can be traced to decisions Congress and the U.S. Environmental

Protection Agency made decades ago, when oil and gas producers lobbied hard to get most of their waste exempted from federal hazardous waste regulations.


In 1988 they succeeded, even though a 1987 EPA study concluded that 23 percent of the waste samples the agency had collected contained one or more toxic compounds at levels 100 times higher than is considered safe for humans. The EPA estimated that without the exemption, 10 to 70 percent of oil and gas waste could be considered hazardous.

Still, the report recommended granting the exemption. The expense of disposing of so much hazardous waste would slow U.S. oil and gas production, the authors said. And there weren't enough hazardous waste facilities to handle that much waste.

For the industry, and for people who live and work near commercial waste facilities, the distinction between hazardous and non-hazardous waste is critical when it comes to air quality.

Pits at hazardous waste sites must be covered—open-air pits are not allowed. Even the transfer of the waste is done through pipes, so emissions don't escape into the air. The EPA requires some type of air monitoring, too.

Pits at non-hazardous facilities, in contrast, allow chemicals in the waste to evaporate directly into the atmosphere. States decide how and where facilities are built and what, if any, monitoring systems they must have. A recent EPA review of oil and gas waste regulations in 27 states, including Texas, Pennsylvania and Colorado, found that none had rules requiring regular air monitoring at commercial solid waste facilities.

Nathan Richardson, an assistant professor of environmental law at the University of South Carolina who studies waste rules, said most states, including Texas, focus on safeguarding ground and surface water, protecting wildlife, keeping out trespassers and restoring land after pits are closed. "None of it that I remember has to do with air," he said.

Travis County Assistant District Attorney Patricia Robertson, the environmental crimes prosecutor for the Texas Environmental Enforcement Task Force, has been frustrated for years because the federal exemption makes it almost impossible to prosecute waste facilities for anything more serious than dust or foul odors, which are considered nuisances under Texas law.

"Until the law is changed, people might be exposed to what ordinarily might be considered hazardous waste," Robertson said.

it contains chemicals known to cause health problems, including cancer. Here's a look at how the exemption evolved:

EPA United States Environmental Protection Agency

**1976** — October: Congress passes the **Resource Conservation and Recovery Act (RCRA)**, which requires the **U.S. Environmental Protection Agency (EPA)** to revamp rules for industry waste management.

1977

**1978** — December: The EPA publishes a draft of the new rules, including a proposal to exempt a handful of oil and gas waste products from being categorized as "hazardous."

1979

**1980** — October: Congress passes an amended version of the rules that temporarily exempts a broad range of oil and gas waste and orders the EPA to study whether to keep the exemption.

1981

**1982** — October: The EPA misses the initial deadline for its hazardous waste exemption study.

1983

1984

1985

1986

**1987** — December: The EPA study is released. Focused on water pollution not air emissions, it finds almost 25% of the waste samples it studied are highly toxic. Still, it supports the exemption, saying the cost to treating the waste as hazardous would be so high that production would likely slow.

**1988** — July: The EPA finalizes the exemption and outlines a plan to boost federal water-contamination waste rules and help states improve their rules, too.

1989

1990

1991

1992

**1993** — March: The EPA clarifies the oil and gas waste regulations but the scope of the exemption is unchanged. Today, more than 20 types of oil and gas waste are included in the exemption.

1994

1995

1996

1997

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2001

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2006

2007

2008

**2009** — October: An EPA study recognizes that air emissions from waste pits pose an environmental risk and investigates the release of volatile organic compounds (VOCs) from waste pits during evaporation.

July: **Rep. Matt Cartwright** (D-Penn.) proposes ending the exemption in a bill called the "Closing Loopholes and Ending Arbitrary and Needless Evasion of Regulations Act of 2013."

**2010** — NRDC

September: The environmental group **Natural Resources Defense Council** petitions the EPA to re-examine the oil and gas waste exemption.

2011

2012

**2013** — August: Cartwright's bill gets its first Texas co-sponsor, **Rep. Eddie Bernice Johnson**. So far, all the co-sponsors are Democrats and the bill is struck in the Subcommittee on Environment and the Economy.

**2014** — April: An EPA review of oil and gas waste rules in the top 27 drilling states finds that no state requires regular air monitoring at such facilities. The EPA currently has no plans to act on these findings.

SOURCE: InsideClimate News research PAUL HORN / InsideClimate News

James Langhorne, chief operating officer of Inland Environmental, a disposal facility south of Houston, bristles when he hears criticism of waste disposal facilities: "We follow the standards set by the people elected to set those standards."

Last year, U.S. Rep. Matthew Cartwright, a first-term Democrat from Pennsylvania, drafted a bill that would remove the industry's hazardous waste exemption, which he said is based not on science but on the industry's successful lobbying. But all of the bill's 70 co-sponsors are Democrats, and the bill is stuck in the Subcommittee on Environment and the Economy.

"I don't expect it will be an easy fight, but it's the right thing to do," Cartwright said.

The hazardous waste exemption has saved oil and gas producers huge amounts of money.

When the EPA was considering the exemption in 1987 it estimated that treating the waste as hazardous could result in $700 million to $4.5 billion in extra costs to consumers.

An executive with a national waste disposal company said that disposing of hazardous waste can cost up to three times as much as disposing of non-hazardous waste, depending on the composition of the load and other factors.

Bill Keffer, a visiting professor of law at Texas Tech University School of Law

and a former state legislator, said that if the industry's waste were re-classified, the ripple effects would be felt from industry boardrooms to the gas pumps.

"What makes economic sense now to develop these new [shale] plays might not make economic sense once this new expense is factored in," said Keffer, who once worked as a corporate lawyer for gasoline-producer ARCO. "So removing the exemption could have a chilling effect on future development."

Alex Mills, president of the Texas Alliance of Energy Producers, said local economies would suffer if production declined, and the cost of electricity produced by gas-powered generating plants would go up. "The unintended consequences would be very far reaching," he said.

But David Brown, a toxicologist and adjunct professor of applied ethics at Fairfield University in Connecticut, said using a standard cost-benefit analysis when people's health may be at risk shows that society has lost its moral compass.

"Someone is putting a value on human life and saying the benefit to the larger society justifies the risks to people," Brown said.

"We have to look deeply at why people's lives place second in this analysis."

Pond seen here in the background brimming with oil and gas wastewater in Frio County has local officials worried because they don't know what's in the liquid or what emissions maybe resulting from evaporation. (Credit: David Hasemyer)

# Little Accounting for Lots of Waste

When the federal exemption for fossil fuel waste was approved in 1988, oil and

gas production in the United States was dropping and finding more domestic supplies was a national imperative. The idea that reclassifying the industry's waste as hazardous might further slow oil production was alarming.

Today, however, domestic production is booming because of the development of hydraulic fracturing, or fracking—the process of blasting water, chemicals and sand down a well to crack open bedrock and tap deeply buried fossil fuels. The United States has so much oil and gas, in fact, that the industry is lobbying Congress for permission to freely export it.

It's impossible to say exactly how much waste the oil and gas boom is generating, or how it's being disposed of. Neither the EPA nor the federal Energy Information Administration collects those statistics. The American Petroleum Institute, an industry trade group, estimated that 18 billion barrels of waste were produced in 1995, before fracking began, but an API spokesman said those numbers haven't been updated.

The bulk of the waste is dirty water from fracking, which contains salts, fracking chemicals and heavy metals from underground. After as much oil and gas as possible is removed from the water, it's either used to frack new wells, or injected deep underground for permanent disposal. A handful of states—including Texas, Utah, and New Mexico—also allow it to be stored in open-air pits, called evaporation ponds.

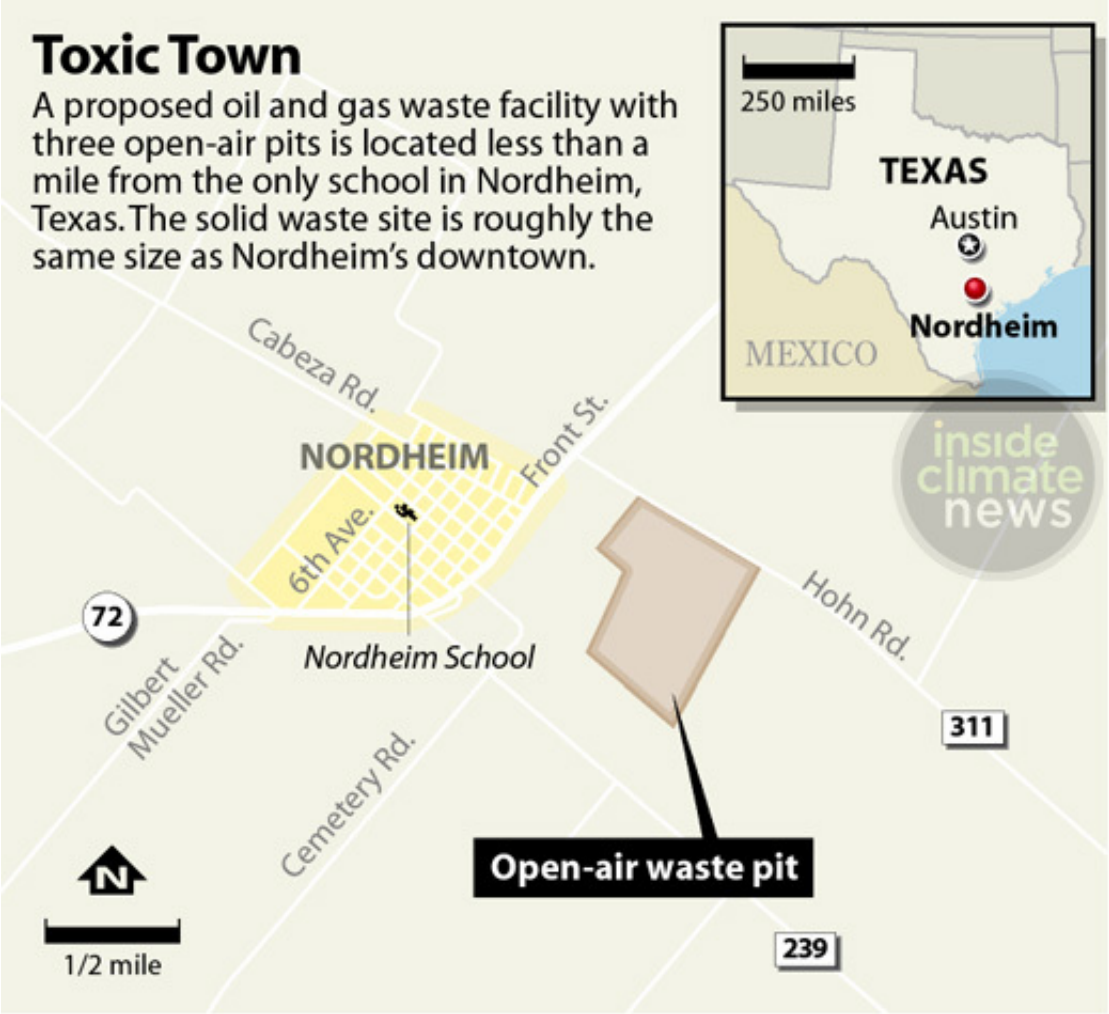
The industry's solid waste—dirt, mud and watery sludge—is generally trucked to waste facilities and dumped into large open pits where it remains until it becomes a gooey sludge the consistency of cake batter. Then it might be spread

on open plots of land and tilled into the soil, a practice called "land farming." Or it might remain in the pits until they are filled and covered with dirt for permanent storage. Some waste may also be mixed with asphalt and used to pave roads. In many states, solid waste can also be buried at drilling sites.

Each of the three solid waste disposal pits Pyote Reclamation Systems LLC wants to build near Nordheim School will be as large as nine city blocks and can hold 720,000 cubic yards of waste, enough to fill the Washington Monument 19 times.

# 'That Just Ain't Right'

In September, about 30 Nordheim residents made the 230-mile round-trip drive to a state hearing in Austin to oppose the Pyote facility near the school. Although the final permit hasn't been issued, Pyote has already bulldozed the land, put up a fence and built a power station.




PAUL HORN / InsideClimate News

The hearing lasted two and a half days, with lawyers and expert witnesses speaking for both sides. Pyote's attorney, John Soule, used the federal hazardous waste exemption as a drumbeat in his opening remarks, saying five times in the first two minutes of his presentation that the material going into the pits wouldn't be hazardous.

"The waste that will be received is…exempt oil and gas waste—by definition nonhazardous," he told the commission hearing officers a minute into his presentation. Twenty seconds later, he made the same point: "In other words, again, only nonhazardous oil and gas waste subject to the commission's jurisdiction would be received and disposed of at this facility."

In the audience was 70-year-old Paul Baumann, who was born in Nordheim and graduated from Nordheim School. Baumann has never been much of an activist. But a few months ago, he grabbed an armful of protest signs emblazoned with a skull and crossbones and the words "Don't Dump On Nordheim" and posted them on fences and gates near the Pyote site.

"They want to poison our water and air with all this hazardous stuff they're bringing in," Baumann said. "That just ain't right."

Also in the audience was state Rep. Geanie W. Morrison, a Republican who has represented Nordheim in the House since 1999 and last year received an 87 percent approval rating from the Texas Association of Business.

"I fully recognize there is a need for the facilities that we are talking about at this hearing" Morrison told the crowd. "I am not naïve that we always be confronted with the 'Not in my backyard' position. But this is truly in the backyard of the entire city of Nordheim.

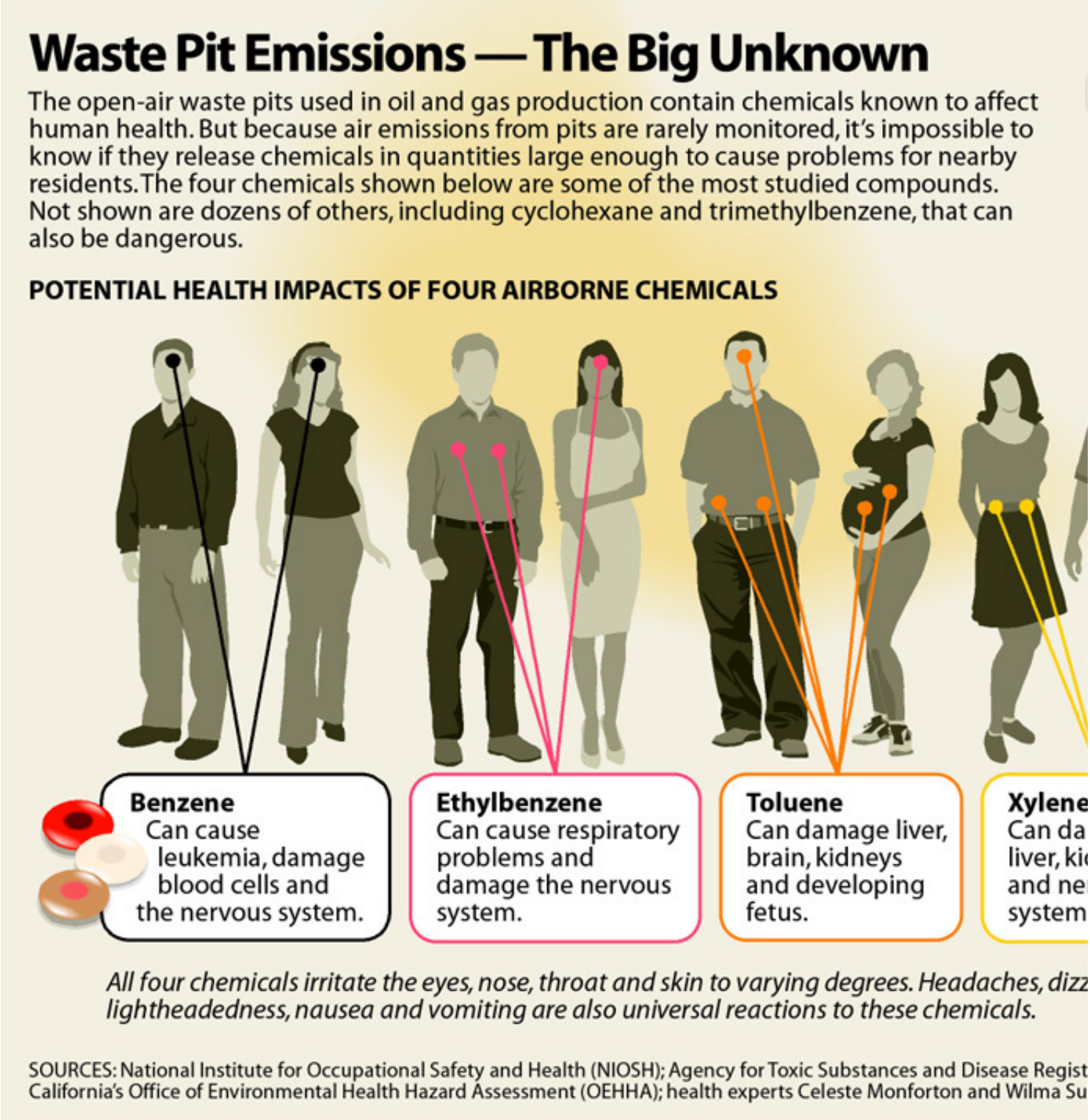
"It might make business sense. But I have yet to see that it makes logical sense for this community."

# Murky Emissions

# Data Stirs Worry

Because Texas, like most states, doesn't require commercial facilities to monitor and collect data about their waste emissions, it's impossible to know whether chemicals are drifting into the air at levels high enough to affect public health.

Oil and gas waste includes volatile organic compounds (VOCs), including benzene, toluene, ethyl benzene and xylene. Depending on the concentration and length of exposure, these chemicals can cause a range of ailments, from minor headaches to neurological damage and cancer. But there has been little or no research on how years of exposure to low doses of these chemicals might affect the general public, including children, the sick and the elderly.




There's also little information about what happens when people are exposed to many chemicals at once, said Stuart Batterman, a professor of environmental health sciences at the University of Michigan's School of Public Health. While the concentration of each chemical may meet current health guidelines, he said,

"there might be an issue [when] taking the sum as a whole."

A few small studies involving untreated drilling wastewater—the part of the waste stream that is usually found at drilling sites and has the highest concentration of chemicals—have produced data and anecdotal evidence that emissions can reach dangerously high levels.

In 2011, Gabrielle Petron, a National Oceanic and Atmospheric Administration scientist working at the University of Colorado, was trying to determine whether emissions from two well sites in northeastern Utah were causing a rise in winter ozone, a major respiratory irritant. During the course of the work, Petron and her team of researchers discovered "out of this world" levels of benzene and toluene coming from small ponds of untreated wastewater near the well sites. At one point, the vapors were so thick that Petron felt nauseous and moved her team out of the area.

"You had to go upwind of the ponds," she said. "You could not stand to be in the downwind emission stream."

The lack of health data, plus the EPA's decision to classify oil and gas production waste as non-hazardous, makes it almost impossible for residents to use air emissions as grounds to object to oil and gas waste operations.

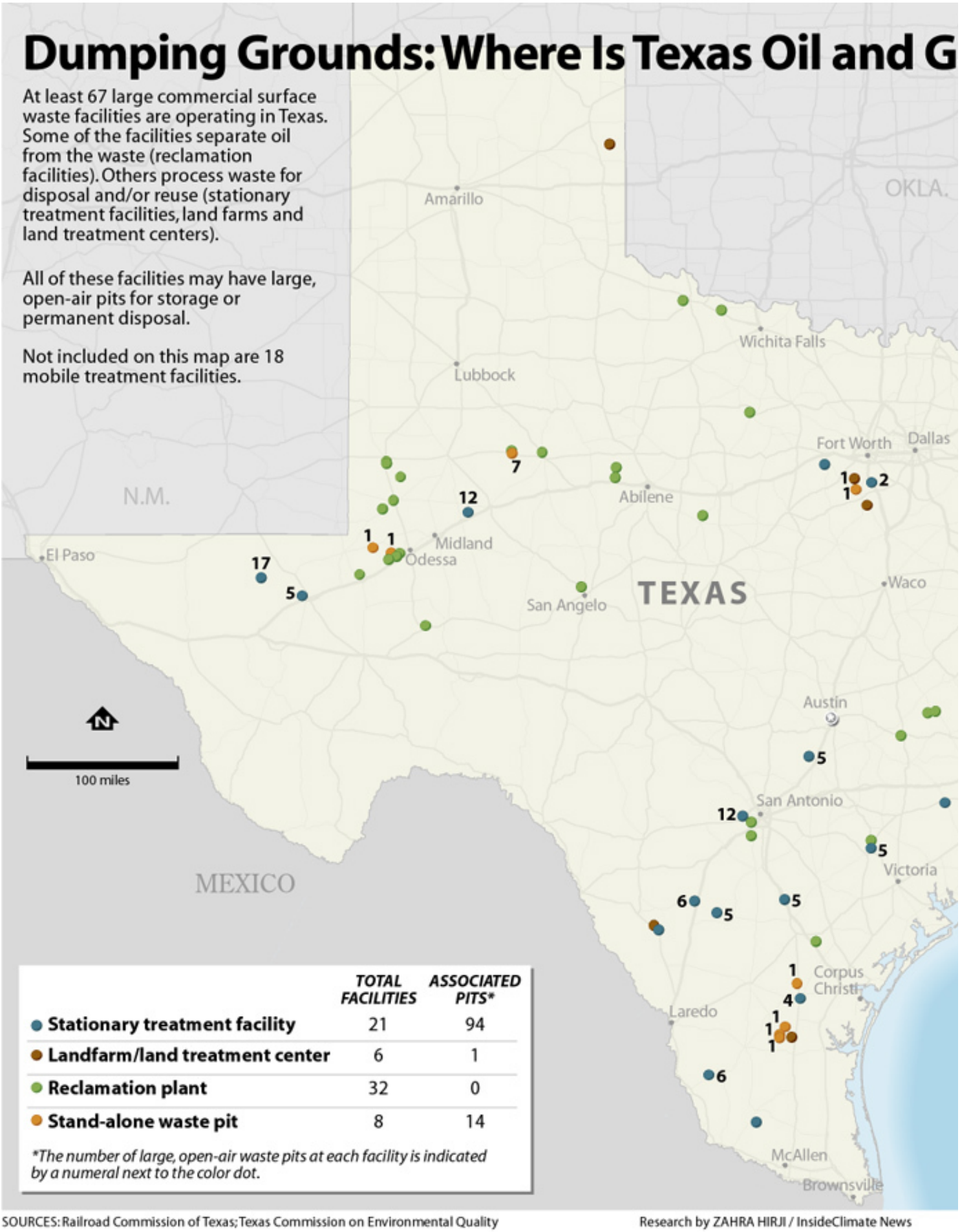
In Texas, a bifurcated regulatory system adds to the confusion.

Construction permits for commercial waste facilities are issued by the state's Railroad Commission, the primary regulator for the oil and gas industry. The agency considers the projects' effects on water, but not on air quality. That

responsibility rests with the Texas Commission on Environmental Quality.

The TCEQ allows some facilities to self-audit air quality under a special category of rules called "permits by rule," which means the agency might not even know the facilities exist.

Other facilities have somewhat stricter air permits, which require them to register with the TCEQ. The permits limit annual emissions. But because they don't require the companies to regularly monitor their emissions or report them to the TCEQ, it's impossible to verify that the limits are being met.




SOURCES: Railroad Commission of Texas; Texas Commission on Environmental Quality

Research by ZAHRA HIRJI / InsideClimate News

For residents, determining what kind of permit a particular facility has is almost impossible, because the agency has a backlog of air permit applications and paperwork. Of the state's 67 largest commercial surface waste facilities, only 10 are listed on the TCEQ's website as having permits. Of those, four have or have applied for the stricter permits. The other six have permits by rule.

TCEQ spokeswoman Andrea Morrow said the agency's focus is on dust and nuisance odors.

"In most cases the liquids have very small concentrations of volatiles or sulfur, thus evaporative emissions are very insignificant but in no case may they cause a nuisance," Morrow said in an email exchange with InsideClimate News.

Morrow said waste pit operators also must comply with the Texas Administrative Code, which prohibits anything that could "adversely affect human health or welfare."

The TCEQ measures general air quality "rather than pollutants from specific sources," Morrow said. To do that, she said the agency oversees “one of the most extensive air toxics monitoring networks in the country." In 2013, she said it loaded data from more than 200 monitoring sites statewide into the TCEQ database.

But an 18-month investigation by the Center for Public Integrity and InsideClimate News revealed that the agency's program is severely limited in some oil and gas production areas. For example, the Center and InsideClimate News reported in February that the TCEQ had only five permanent air monitors in the heavily drilled Eagle Ford Shale in South Texas, an area roughly twice the

size of Massachusetts. The agency recently announced it will add another monitor in the area.

Because waste facilities fall under the jurisdiction of two Texas regulatory agencies, people are often confused about where to turn for help.

About 50 miles southwest of Houston, officials at the Rice Consolidated Independent School District, which serves more than 1,100 students on six campuses, want to know more about emissions from a commercial oil and gas waste facility that sits within a couple of miles of two schools.

But Michelle Morris, the district's lawyer, said a TCEQ official claimed the agency has no jurisdiction over the emissions, and the Railroad Commission said the same thing. The district has contacted the EPA but hasn't gotten a response.

"I'm sure there is an agency responsible for monitoring the air," Morris said, "but we can't figure out what that agency is."

Ilan Levin, associate director of the Environmental Integrity Project's chapter in Austin, thinks the state's regulatory process is intentionally ambiguous and confusing.

"All of the rules are vague enough that it allows the industry to game the system," Levin said. "They can interpret the rules for their benefit."

Former EPA Regional Administrator Al Armendariz, who resigned in 2012 amid criticism of his hardline stand against lax oil and gas rules in Texas, said the

TCEQ's permitting system shows that "in their mind they have already made a determination that such facilities will not have a human health impact."

Armendariz now leads the Beyond Coal campaign for the Lone Star Chapter of the Sierra Club.

# Health Concerns Not Enough for Regulators

In 2010, people living downwind from a waste facility in Cleburne, Texas complained to the TCEQ "about the odor causing headache and nausea and forcing them to discontinue their outdoor work and to move indoors," according to a TCEQ report obtained under the Texas Public Information Act.

A TCEQ investigator confirmed the odor was coming from pits containing oil field waste, according to the report. He could smell a natural gas odor, but said his breathing wasn't affected.

The inspector took an air sample that disclosed trace amounts of benzene, toluene and ethylbenzene, but in concentrations below levels Texas considers a health hazard. The TCEQ determined there had been no violations.

A Borden County couple, Joel and Betty Dennis, had a similar experience when they complained to the TCEQ between 1995 and 2003 about foul odors coming from a Westex Systems disposal facility three miles from their house.

Sometimes the odors were so bad that the Dennises said they felt nauseous and stayed indoors. But when the TCEQ investigated, it found no violations.

On another occasion, the couple complained to the Railroad Commission about a foul smell characteristic of hydrogen sulfide, a potentially lethal gas. Again, there was an investigation. But the commission's only recommendation was that the company should erect some sort of cover over the pits to keep birds out.

In 2008, the Dennises discovered that Westex had applied to the Railroad Commission for a permit to build an additional pit on the site. The fifth pit—375 feet long, 135 feet wide and 18 feet deep—would hold 163,000 barrels of oil and gas waste, according to commission documents.

Outraged, the Dennises drove almost 700 miles round trip to a commission hearing in Austin to oppose the new pit. Despite their plea, the company's application was approved.

"Concerns about odor and adverse health effects as a result of operation of the facility do not provide a basis for the Commission's denial of the application of an additional pit at the facility," the examining officers said in their

recommendation to the commission.

The Westex Systems facility closed last year, not because of complaints but because its five pits were filled to capacity with 1.1 million barrels of waste.

"Against an industry that is so much of the Texas economy, we didn't count," Betty Dennis said.

**(Broadway is the main street though the tiny South Texas town of Nordheim where residents are outraged over a proposal to locate a 204-acre oil and gas waste facility less than a mile from the city's center. Credit: David**

Hasemyer, InsideClimate News)

# Tiny Notice Sparks Huge Protest

The lack of scientific information about oil and gas waste emissions, plus the lack of regulations, leaves residents and local officials who object to gas and oil waste sites with few options.

Kathy Payne discovered that in April 2013 when she got to her office just around the corner from Oralia's beauty shop to begin another uneventful day as mayor of Nordheim, population 307.

After settling into her worn leather chair, she opened the latest edition of the local weekly newspaper. Starting at the front, she read about a standout high school track star and an upcoming community potluck.

But it was a tiny notice at the back of the paper that caught her attention: an announcement that an application had been filed with the Railroad Commission for a permit to build a waste facility on the outskirts of Nordheim. At 204 acres, it would be nearly the size of her town.

"Oh, holy hell! What's this?" Payne remembers shouting.

Texas law requires companies that want to build waste facilities to notify adjacent landowners. City officials also must be notified —but that requirement didn't apply in this case because the facility sits outside Nordheim's city limits.

Paul Baumann and other landowners whose properties adjoin the Pyote site received thick blue binders from the company, filled with schematics and technical data about the proposed facility. They formed a grassroots opposition group called Concerned About Pollution, or CAP, and held their first meeting under the gazebo in Nordheim's Jubilee Park.

CAP now has about 400 members and has raised roughly $20,000, most of it already spent on attorney and consultant fees.

As the group coalesced, Baumann said Pyote took notice and made some alterations in its plans for the facility. But CAP wants the application denied, not

adjusted, and he worries the company will simply outlast them.

"We have the determination but they have all the money," he said.

George Wommack is CEO of Petro Waste Environment LP, whose Pyote Reclamation Systems is building the Nordheim facility. He points to the federal hazardous waste exemption as proof that the sludge his company will be receiving at the Nordheim site is harmless. If school superintendent Wilson or Mayor Payne or anyone else has a gripe, Wommack said, they should take it up with the EPA.

"Most of what we're dealing with here is dirt," he said.

In its application to the Railroad Commission for a construction permit, Pyote said it didn't need a TCEQ air permit. But in a recent interview, Wommack said the company will hire consultants to determine whether a permit is needed.

# Nationwide, Rules Begin to Tighten

As oil and gas development spreads across the United States, more communities are raising concerns about the industry's waste.

At least 20 towns, districts, counties or states have passed laws regulating various parts of the waste disposal process.

Longmont, Colo., Pelham, Mass. and Buffalo, N.Y. have banned the storage, treatment and disposal of fracking wastewater within their borders. Ohio has banned new wastewater ponds, and Pennsylvania is trying to ban them. In 2012 Vermont became the first state to indefinitely prohibit the collection, storage and treatment of fracking waste. Connecticut passed a three-year ban this year and a waste ban bill is pending in Massachusetts.

But some places are resistant to change—and some have even reversed strict waste rules.

New Jersey's legislature has twice rejected legislation that would keep fracking waste from entering its borders.

New Mexico passed some of the nation’s strictest waste pit and pond rules in 2008 under Democratic Gov. Bill Richardson. But in 2013, under a Republican administration, they were weakened. The New Mexico Environmental Law Center has filed a lawsuit on behalf of Earthworks’ Oil and Gas Accountability Project challenging the slimmed-down rule.

At the national level, Matt Cartwright, the Pennsylvania congressman who is trying to repeal the industry's hazardous waste exemption, campaigned on a promise he would fight to make sure that fracking doesn't pollute air and water.

Cartwright says he isn't opposed to drilling, but wants it done safely.

"I think requiring responsible regulation of the fracking industry and responsible handling of hazardous waste is the least we should be doing," he said.

So far, Cartwright's bill—the Closing Loopholes and Ending Arbitrary and Needless Evasion of Regulations Act, or CLEANER—has gone nowhere. But in August, he scored a small victory when Texas Rep. Eddie Bernice Johnson became CLEANER's 70th co-sponsor.

Johnson, whose North Texas district includes part of the Barnett Shale, declined to be interviewed but said in a written statement that "oil and natural gas companies should be held to the same standard as other industries."

"If we are going to ask the EPA to effectively protect the public health and the environment, we should not make special exceptions for an industry that has a long history of polluting the environment," Johnson said.

In May, more than 50 Texas community leaders urged Democratic Congressman Lloyd Doggett, whose district includes Austin, to co-sponsor the bill.

Their letter notes that open pits of drilling mud waste contaminated four family water wells in Montague County in 2011 and pleads: "With the state of Texas failing to protect us, we need the federal government to act to protect communities in Texas from fracking."

As of Wednesday, Doggett had not signed as a co-sponsor. His office did not

respond to requests for comment.

# A Question of Common Sense

School Superintendent Wilson, who wears a burgundy polo shirt with a yellow embroidered Nordheim Pirates logo, is still struggling to understand the logic of putting a waste facility so close to his school.

As he speaks, the trees rustle in a persistent and predictable wind that swirls across the playground after sweeping across the Pyote site. It blows almost every day and is as much a part of life in this small South Texas community as 4-H shows and rodeos.

"There is a lot of area out here for things like this," Wilson said. "Common sense says you don't put something like this so close to a community and a school. Just think about it."

Like so many others in Nordheim and across the Eagle Ford, Wilson doesn't oppose oil and gas development. It has brought prosperity to his town, which

last year approved a $3.7 million bond for renovations to his 65-year-old school.

But with that good fortune comes responsibility, Wilson said: "Doing the right things can't get lost."

*The Center for Public Integrity and InsideClimate News have been investigating oil and gas air emissions in Texas for 18 months. This story was produced in partnership with Inside Energy and its public radio affiliates. Lisa Song, Hannah Robbins, Jim Morris, David Martin Davies and Eleanor Bell contributed to the reporting.*

This video was reported by the Center for Public Integrity's Eleanor Bell: